

Accuracy Characteristics for Final Delivery Scenario Hours 1400-1900 Single Site

1 Introduction

This document contains scenario characteristics for hours 1400 to 1900 GMT recorded on May 26, 1999 at Memphis ARTCC and cover either the ZME or ZID airspace. Characteristics to be provided are general statistics determined from the scenario on airspace characteristics, aircraft to aircraft and aircraft to airspace encounters, general air traffic, aircraft, flight plan adherence, interfacility traffic flow and deviations in weather forecasts. Definitions of the provided scenario characteristics are provided in Reference[1].

2 Reference

[1] Paglione,M., Oaks,R., Ryan,Dr. H., Summerill,J.S., (Final, January 2000), *Description of Accuracy Scenarios for the Acceptance Testing of the User Request Evaluation Tool (URET) / Core Capability Limited Deployment (CCLD)*, FAA William J. Hughes Technical Center / ACT-250, Atlantic City, New Jersey.

NOTE – Section numbers in this document do not map to those of the reference document.

3 Center Airspace

This section corresponds to Section 3.1 of Reference[1]. The below data corresponds to the ZME Center using the May 20, 1999 ACES chart cycle. Information gathered from running URET PRE, accessing the ZME Center Internet site and local knowledge.

Metric	Definitions	Count
Center Area	Approximate Square Miles	120000
Airports	From URET DU Adaptation List	778
Sectors	From URET DU Adaptation List	110
SAA	Special Activities Airspace	57
APDIA	Automated Problem Detection Inhibited Area	20
SID	Standard Instrument Departure	11
STAR	Standard Arrival Route	10
PAR	Preferential Arrival Route	594
PDR	Preferential Departure Route	346
PDAR	Preferential Departure Arrival Route	124

4 Aircraft Encounter Distributions

The statistics collected in this section characterize aircraft to aircraft encounters. The encounter counts are partitioned by selected minimum horizontal separation intervals, a count of encounters partitioned by standard flight levels, and by vertical phase of flight and aircraft encounter angle. This section corresponds to Section 3.2.1 in Reference[1].

4.1 Count Partitioned by Minimum Horizontal Separation

This section corresponds to Section 3.2.1.1 in Reference[1].

Table 1: Count of Current Plan Aircraft Encounters

Min. Horz. Separation (nm)	Without Adherence	13 Minutes Adherence
$0 \leq d < 5$	130	80
$5 \leq d < 10$	184	98
$10 \leq d < 15$	211	118
$15 \leq d < 23$	434	261
$23 \leq d < 30$	416	251
Total	1375	808

Table 2: Count of Trial Plan Aircraft Encounters

Min. Horz. Separation (nm)	Without Adherence	20 minutes Adherence
$0 \leq d < 5$	130	73
$5 \leq d < 10$	184	92
$10 \leq d < 15$	211	113
$15 \leq d < 24$	496	283
$24 \leq d < 30$	354	197
Total	1375	758

4.2 Count Partitioned by Altitude for Standard Separation Intervals

This section corresponds to Section 3.2.1.2 of Reference[1].

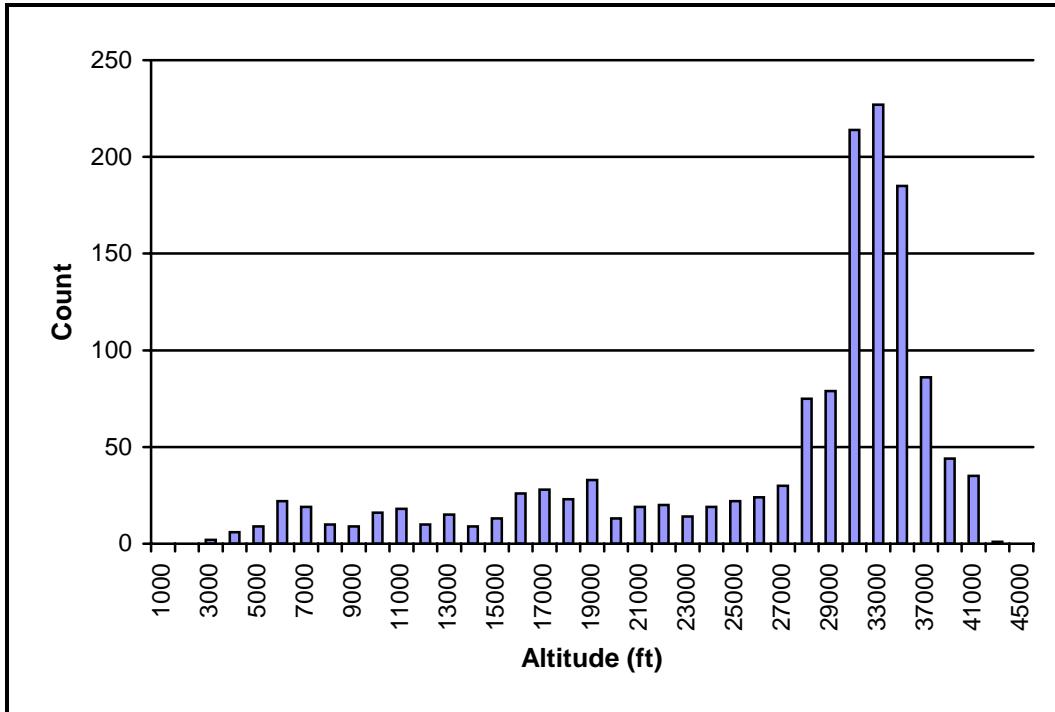


Figure 1: Aircraft to Aircraft Encounters by Altitude

4.3 Count Partitioned by Vertical Phase of Flight and Encounter Angle

This section corresponds to Section 3.2.1.3 of Reference[1].

Table 3: Count of Aircraft Encounters Partitioned by Phase of Flight and Encounter Angle

Vertical Phase	Encounter Angles (deg)				Total
	[0, 45)	[45, 90)	[90, 135)	[135, 180]	
Cruise-Cruise	122	111	52	28	313
Descend-Descend	47	12	8	10	77
Climb-Climb	39	10	2	7	58
Cruise-Climb	160	78	81	93	412
Cruise-Descend	140	93	67	112	412
Climb-Descend	30	14	8	28	80
Unknown	18	3	2	0	23
Total	556	321	220	278	1375

5 Airspace Encounter Distributions

This section provides statistics on aircraft to airspace encounters. Three areas considered are counts partitioned by selected minimum horizontal separation intervals, an encounter count partitioned by standard flight levels, and a count partitioned by vertical phase of flight and airspace encounter angle. Additionally, vertical phase of flight count is separated into top, bottom and side airspace encounters and for encounters with unknown encounter angles. The section corresponds to Section 3.2.2 of Reference[1].

5.1 Count Partitioned by Minimum Horizontal Separation

The section corresponds to Section 3.2.2.1 of Reference[1].

Table 4: Count of Current Plan Airspace Encounters by Horizontal Separation

Min. Horz. Separation (nm)	Without Adherence	13 minutes Adherence
Conflicts ¹	2195	1863
$d = 0^2$	42	37
$0 < d < 7$	884	704
$7 \leq d < 9$	220	174
$9 \leq d < 11$	190	136
$11 \leq d < 16$	505	401
$16 \leq d < 30$	1740	1352
Total	5776	4667

Table 5: Count of Trial Plan Airspace Encounters by Horizontal Separation

Min. Horz. Separation (nm)	Without Adherence	20 minutes Adherence
Conflicts ³	2195	1821
$d = 0^4$	42	36
$0 < d < 8$	1003	779
$8 \leq d < 11$	291	215
$11 \leq d < 13$	185	141
$13 \leq d < 19$	706	568
$19 \leq d < 30$	1354	997
Total	5776	4557

¹ This count includes encounters that are conflicts. By definition the minimum horizontal separation is zero and the track point actually penetrates the airspace.

² This count includes encounters without valid airspace penetrations, which occurs under two cases: a short duration penetration or an encounter on the actual buffered boundary of the airspace which does not penetrate.

³ This count includes encounters that are conflicts. By definition the minimum horizontal separation is zero and the track point actually penetrates the airspace.

⁴ This count includes encounters without valid airspace penetrations, which occurs under two cases: a short duration penetration or an encounter on the actual buffered boundary of the airspace which does not penetrate.

5.2 Count Partitioned by Altitude

This section corresponds to Section 3.2.2.2 of Reference[1].

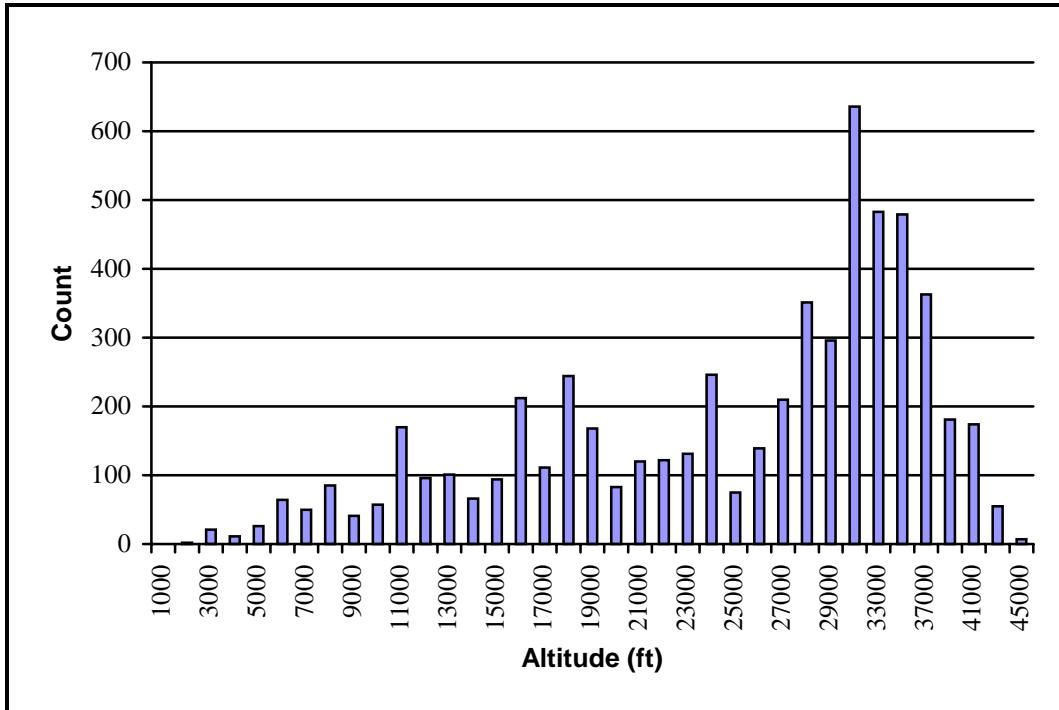


Figure 2: Airspace to Airspace Encounters by Altitude

5.3 Count by Vertical Phase of Flight and Encounter Angle

This section corresponds to Section 3.2.2.3 in Reference[1].

Table 6: Count of Airspace Encounters by Angle and Vertical Phase of Flight for Side Conflicts

Vertical Phase	Encounter Angles (deg)			Total
	[0, 30)	[30, 60)	[60, 90)	
Climb	11	59	119	189
Cruise	172	516	753	1441
Descend	15	57	62	134
Total	198	632	934	1764

Table 7: Count of Airspace Encounters by Angle and Vertical Phase of Flight for Top and Bottom Conflicts

Vertical Phase	Encounter Angles (deg)			Total
	[0, 30)	[30, 60)	[60, 90)	
Climb	154	0	0	154
Cruise	0	0	0	0
Descend	25	0	0	25
Total	179	0	0	179

Table 8: Count of Airspace Encounters by Vertical Phase of Flight with Unknown Angles

Vertical Phase	Count
Climb	53
Cruise	163
Descend	36
Total	252

6 Air Traffic Distributions

This section provides metrics that characterize the air traffic. The metrics are flight density partitioned by standard flight levels, flight type and sector penetration, statistics on the number of active flights, ground speed statistics, counts of interim altitude and amendment messages, and air traffic maneuvers by altitude and phase of flight. This section corresponds to Section 3.3 of Reference[1].

6.1 Air Traffic Density

This section corresponds to section 3.3.1 of Reference[1]. Detailed statistics on aircraft encounters are provided in Appendix A.

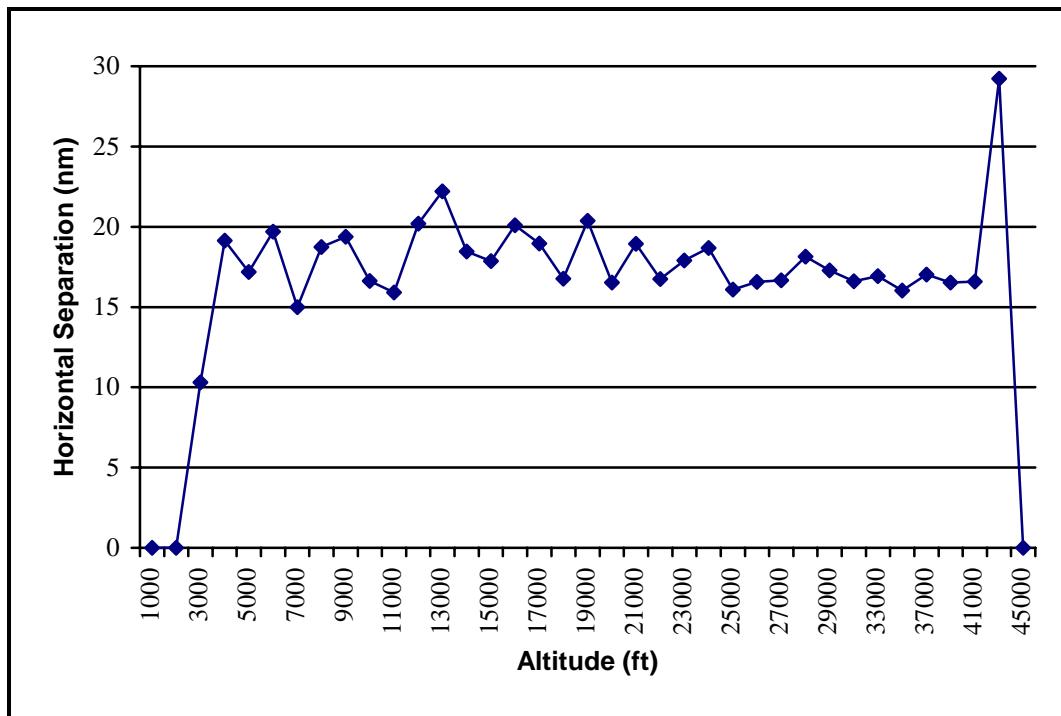


Figure 3: Average Horizontal Separation by Altitude for All Hours

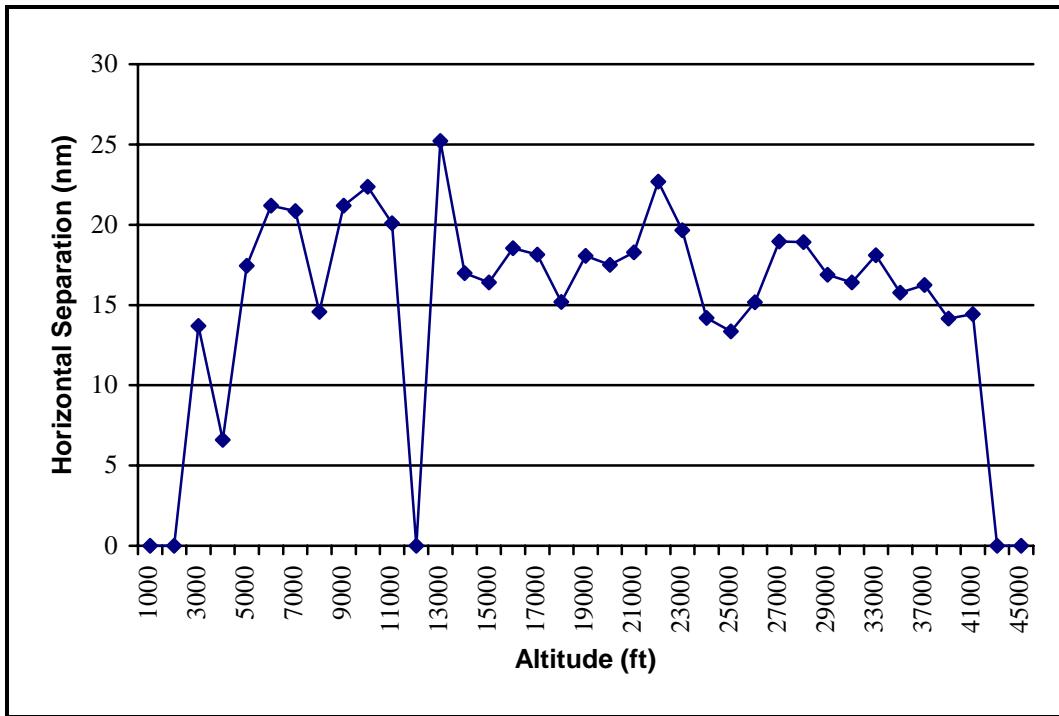


Figure 4: Average Horizontal Separation by Altitude for Hour 1

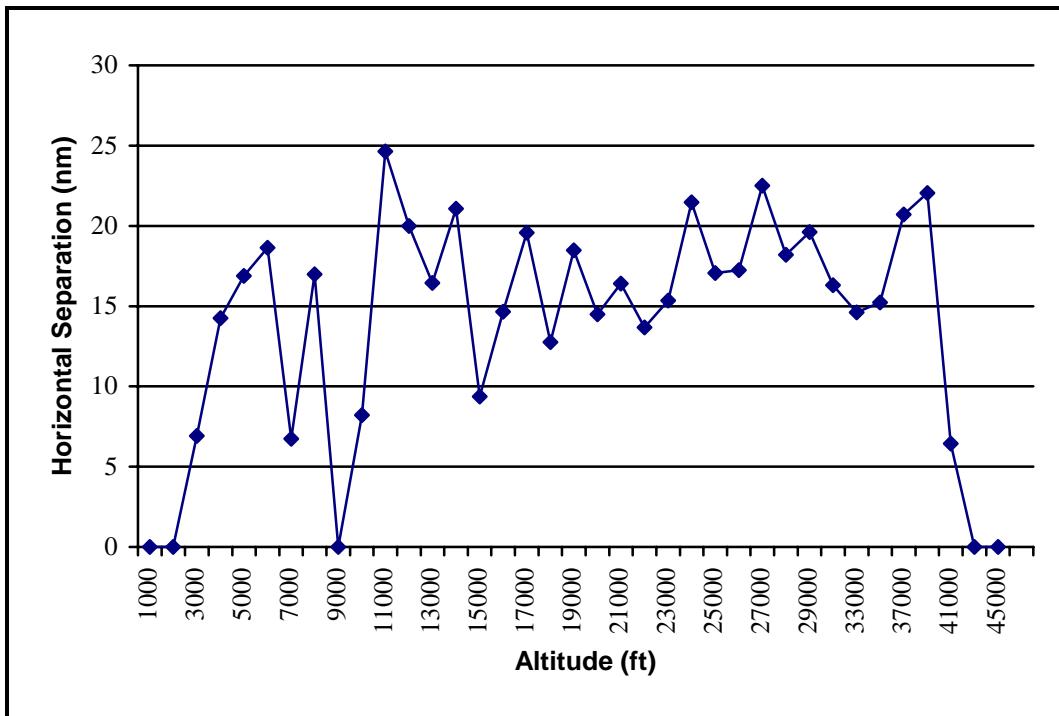


Figure 5: Average Horizontal Separation by Altitude for Hour 2

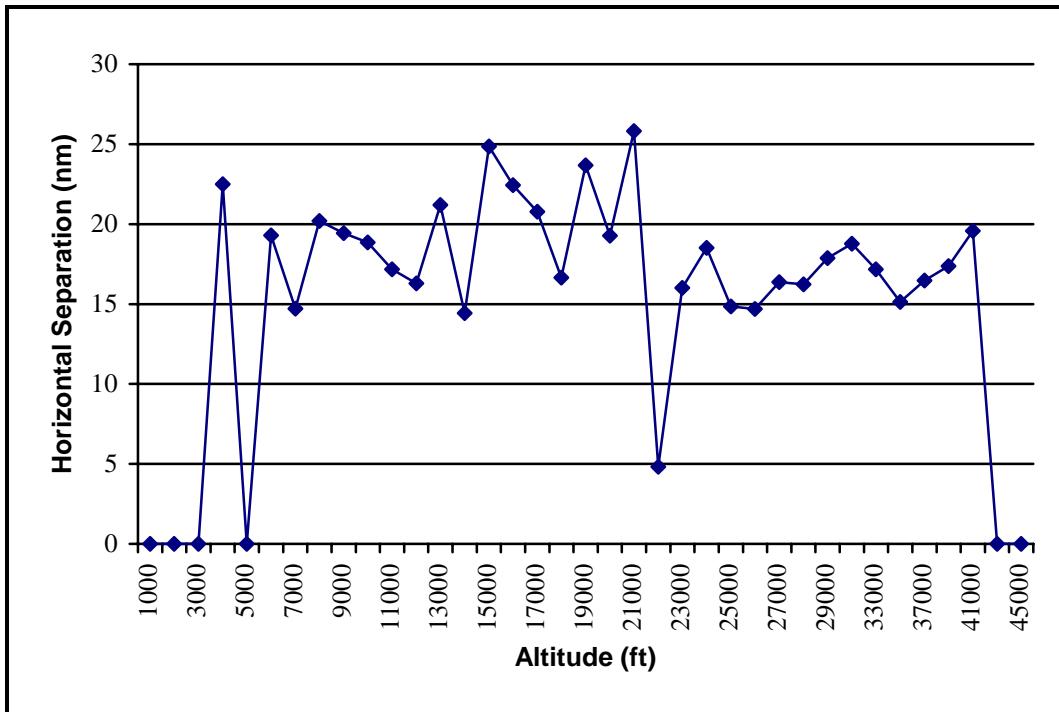


Figure 6: Average Horizontal Separation by Altitude for Hour 3

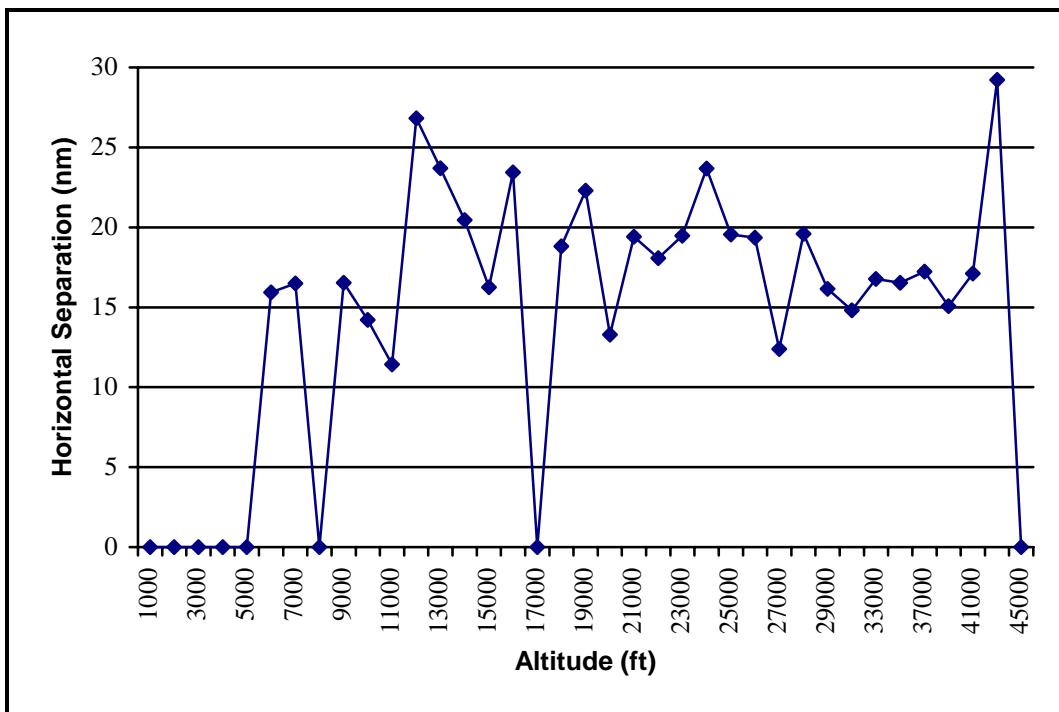


Figure 7: Average Horizontal Separation by Altitude for Hour 4

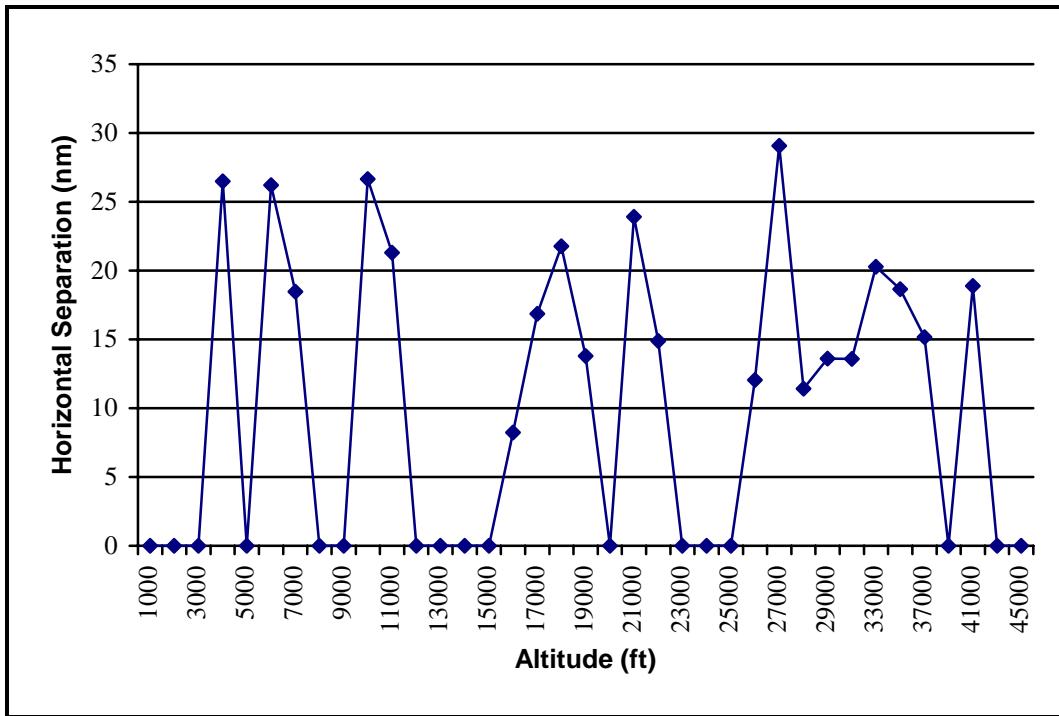


Figure 8: Average Horizontal Separation by Altitude for Hour 5

Appendix A: Supplement to Section 6.1 - Aircraft Traffic Density

Table 9: Statistics on Aircraft Encounters by Altitude Interval for All Hours

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	2	10.297	4.794
4000	6	19.146	7.470
5000	9	17.190	8.723
6000	22	19.695	8.164
7000	19	15.000	8.014
8000	10	18.743	6.257
9000	9	19.373	7.902
10000	16	16.627	7.060
11000	18	15.901	7.899
12000	10	20.192	8.933
13000	15	22.198	5.604
14000	9	18.451	6.353
15000	13	17.851	8.409
16000	26	20.099	7.806
17000	28	18.949	6.292
18000	23	16.769	7.160
19000	33	20.370	6.815
20000	13	16.519	7.471
21000	19	18.940	8.401
22000	20	16.751	8.324
23000	14	17.909	9.812
24000	19	18.672	7.122
25000	22	16.087	8.068
26000	24	16.572	8.766
27000	30	16.671	8.760
28000	75	18.146	8.249
29000	79	17.275	7.412
31000	214	16.606	8.271
33000	227	16.914	8.510
35000	185	16.028	7.966
37000	86	17.027	7.923
39000	44	16.524	7.851
41000	35	16.583	8.225
43000	1	29.224	0.000
45000	0	0.000	0.000
Total	1375		

Table 10: Statistics on Aircraft Encounters by Altitude for Hour 1

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	1	13.687	0.000
4000	1	6.603	0.000
5000	5	17.435	6.983
6000	4	21.184	8.238
7000	2	20.857	5.312
8000	2	14.574	4.109
9000	3	21.181	6.629
10000	2	22.373	0.399
11000	2	20.102	12.935
12000	0	0.000	0.000
13000	3	25.212	3.108
14000	4	16.993	8.777
15000	1	16.412	0.000
16000	9	18.547	7.415
17000	15	18.133	7.113
18000	6	15.195	4.920
19000	9	18.055	7.018
20000	4	17.507	9.400
21000	3	18.287	4.325
22000	4	22.683	3.967
23000	5	19.650	9.864
24000	8	14.188	5.465
25000	5	13.349	9.296
26000	7	15.178	9.820
27000	2	18.960	9.926
28000	28	18.917	8.861
29000	30	16.890	8.595
31000	82	16.403	8.193
33000	60	18.095	8.387
35000	52	15.767	8.498
37000	15	16.239	8.308
39000	1	14.150	0.000
41000	10	14.437	8.989
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	385		

Table 11: Statistics on Aircraft Encounters by Altitude for Hour 2

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	1	6.907	0.000
4000	1	14.262	0.000
5000	4	16.885	11.733
6000	4	18.636	8.794
7000	2	6.745	0.381
8000	1	16.982	0.000
9000	0	0.000	0.000
10000	3	8.217	2.061
11000	1	24.632	0.000
12000	2	19.993	7.830
13000	2	16.449	4.125
14000	3	21.068	4.615
15000	2	9.365	8.296
16000	2	14.651	18.906
17000	3	19.575	9.298
18000	3	12.753	10.769
19000	4	18.469	11.482
20000	1	14.496	0.000
21000	7	16.413	9.418
22000	5	13.665	7.887
23000	3	15.347	11.196
24000	4	21.466	6.921
25000	3	17.054	7.521
26000	2	17.245	11.662
27000	7	22.513	7.542
28000	6	18.194	6.877
29000	15	19.610	5.757
31000	36	16.313	7.273
33000	52	14.619	8.321
35000	29	15.238	8.221
37000	8	20.708	6.117
39000	4	22.053	5.316
41000	1	6.440	0.000
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	221		

Table 12: Statistics on Aircraft Encounters by Altitude for Hour 3

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	0	0.000	0.000
4000	3	22.504	2.233
5000	0	0.000	0.000
6000	6	19.288	10.574
7000	11	14.711	8.887
8000	7	20.186	6.868
9000	4	19.440	9.977
10000	6	18.862	3.322
11000	7	17.162	7.163
12000	5	16.299	10.574
13000	5	21.192	7.212
14000	1	14.439	0.000
15000	4	24.859	1.558
16000	10	22.441	6.447
17000	8	20.766	4.463
18000	6	16.652	7.431
19000	5	23.679	4.066
20000	4	19.264	6.607
21000	1	25.818	0.000
22000	1	4.833	0.000
23000	3	16.008	13.334
24000	2	18.518	12.177
25000	8	14.842	7.948
26000	4	14.683	6.474
27000	7	16.368	5.574
28000	12	16.222	7.792
29000	13	17.871	6.264
31000	51	18.773	8.076
33000	55	17.176	8.536
35000	31	15.128	8.027
37000	13	16.475	8.706
39000	16	17.373	8.931
41000	7	19.568	7.281
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	316		

Table 13: Statistics on Aircraft Encounters by Altitude for Hour 4

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	0	0.000	0.000
4000	0	0.000	0.000
5000	0	0.000	0.000
6000	5	15.928	6.027
7000	3	16.499	7.527
8000	0	0.000	0.000
9000	2	16.527	9.325
10000	4	14.205	9.161
11000	7	11.420	6.988
12000	3	26.813	1.055
13000	5	23.695	4.626
14000	1	20.446	0.000
15000	6	16.248	9.105
16000	4	23.426	3.214
17000	0	0.000	0.000
18000	6	18.804	7.789
19000	13	22.297	5.559
20000	4	13.291	8.038
21000	6	19.414	10.355
22000	7	18.070	9.167
23000	3	19.467	10.079
24000	5	23.671	4.874
25000	6	19.545	8.267
26000	9	19.352	9.085
27000	13	12.382	8.927
28000	24	19.599	7.587
29000	18	16.152	7.414
31000	43	14.808	9.277
33000	48	16.779	8.684
35000	60	16.536	7.678
37000	40	17.230	7.890
39000	23	15.075	7.329
41000	16	17.109	8.302
43000	1	29.224	0.000
45000	0	0.000	0.000
Total	385		

Table 14: Statistics on Aircraft Encounters by Altitude for Hour 5

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	0	0.000	0.000
4000	1	26.497	0.000
5000	0	0.000	0.000
6000	3	26.216	4.837
7000	1	18.470	0.000
8000	0	0.000	0.000
9000	0	0.000	0.000
10000	1	26.651	0.000
11000	1	21.312	0.000
12000	0	0.000	0.000
13000	0	0.000	0.000
14000	0	0.000	0.000
15000	0	0.000	0.000
16000	1	8.240	0.000
17000	2	16.851	1.372
18000	2	21.756	7.577
19000	2	13.791	2.692
20000	0	0.000	0.000
21000	2	23.905	4.554
22000	3	14.881	9.036
23000	0	0.000	0.000
24000	0	0.000	0.000
25000	0	0.000	0.000
26000	2	12.047	11.294
27000	1	29.070	0.000
28000	5	11.415	9.338
29000	3	13.613	7.745
31000	2	13.583	2.241
33000	12	20.288	8.014
35000	13	18.640	6.699
37000	10	15.171	8.243
39000	0	0.000	0.000
41000	1	18.874	0.000
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	68		